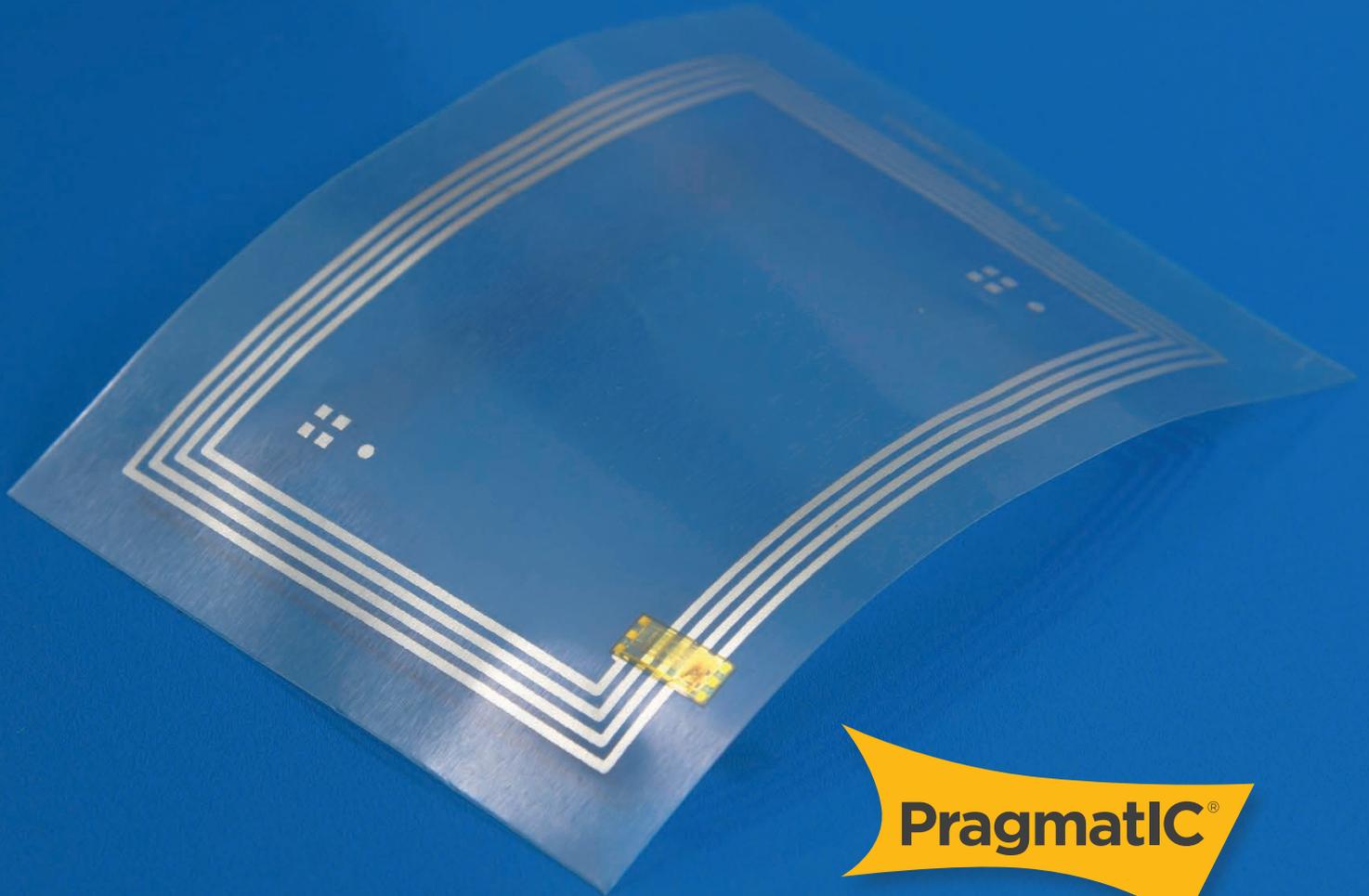


ENABLING TRILLIONS OF SMART OBJECTS



PragmatIC[®]

PragmatIC is reinventing electronics for mass market applications. Its unique technology platform delivers ultra-low cost flexible integrated circuits (FlexICs) thinner than a human hair that can easily be embedded into everyday objects.

Revolutionising Near Field Communications (NFC) using PragmatIC's unique technology looks set to change the shopping experience for millions of consumers in the years to come. PragmatIC's CTO Richard Price tells us how.



 <p>In Store</p> <p>Product information</p> <ul style="list-style-type: none"> - Authentication - Ratings / reviews / testimonials - Product contents - Product story (source-to-shelf) - Multiple languages - Complementary products - Brand story <hr/> <p>Promotions</p> <ul style="list-style-type: none"> - Discount coupons - Loyalty points 	 <p>At Home</p> <p>Product information</p> <ul style="list-style-type: none"> - Product tutorials - Extended product information - User manual - FAQs - Assembly instructions <hr/> <p>Product engagement</p> <ul style="list-style-type: none"> - Product registration - Direct feedback to brand - Connect with other product users (social media) 	 <p>End of Life</p> <p>Product information</p> <ul style="list-style-type: none"> - Add ratings / reviews - Product recommendations <hr/> <p>Re-order</p> <ul style="list-style-type: none"> - Online - Where to buy - Automatic stock check <hr/> <p>Disposal</p> <ul style="list-style-type: none"> - Recycling information - Automated waste sorting
---	--	---

The power of tagging and tapping

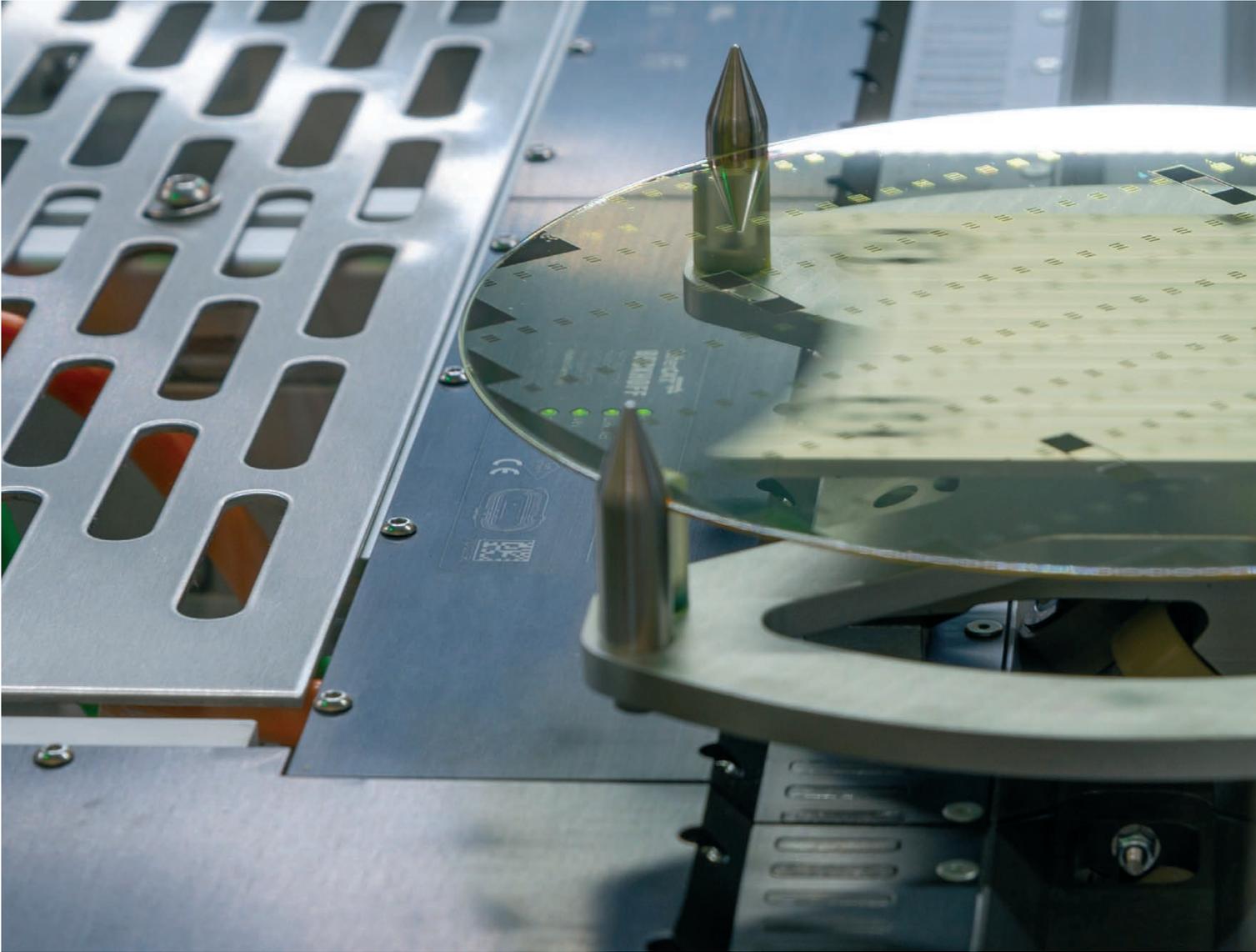
Embedding NFC enabled tags into supermarket products offers brands the opportunity to transform everyday items into key marketing assets, influencing purchasing behaviour and building direct connections with customers in an ever more competitive landscape. Consumers can benefit from interactive personalised experiences, with access to product information before, during and after purchase, simply by tapping their NFC enabled smartphones.



The solution for mass market tagging is now here

Around 80% of smartphones are already NFC enabled and current estimates suggest there will be a total installed base of around 3.5 billion capable handsets by 2019. That means there's plenty of consumers ready to use the technology. However, so far campaigns have been limited to premium products or special promotions. Although conventional tagging technology based on classic silicon integrated circuits (ICs) has indeed achieved cost reductions of over 50% in the last 10 years, at around 10¢ per tag the costs still remain a factor of 10 too high for brands in the Fast Moving Consumer Goods (FMCG) sector. Plus, from a practical perspective, the "hard" silicon-based tags can be susceptible to impact damage and in some cases require compromise on the packaging itself. That's where PragmatIC's FlexIC technology now steps in.

Tags based on FlexICs are ultra-thin and flexible. Unlike silicon-based tags they can be integrated invisibly on any type of packaging and unlike other approaches like barcodes and QR codes they are also smaller, can be integrated behind labels and packaging without affecting brand identity and offer much greater functionality. Most importantly of all though, they offer the potential to achieve that all important 1¢ manufacturing cost target essential for the FMCG industry.



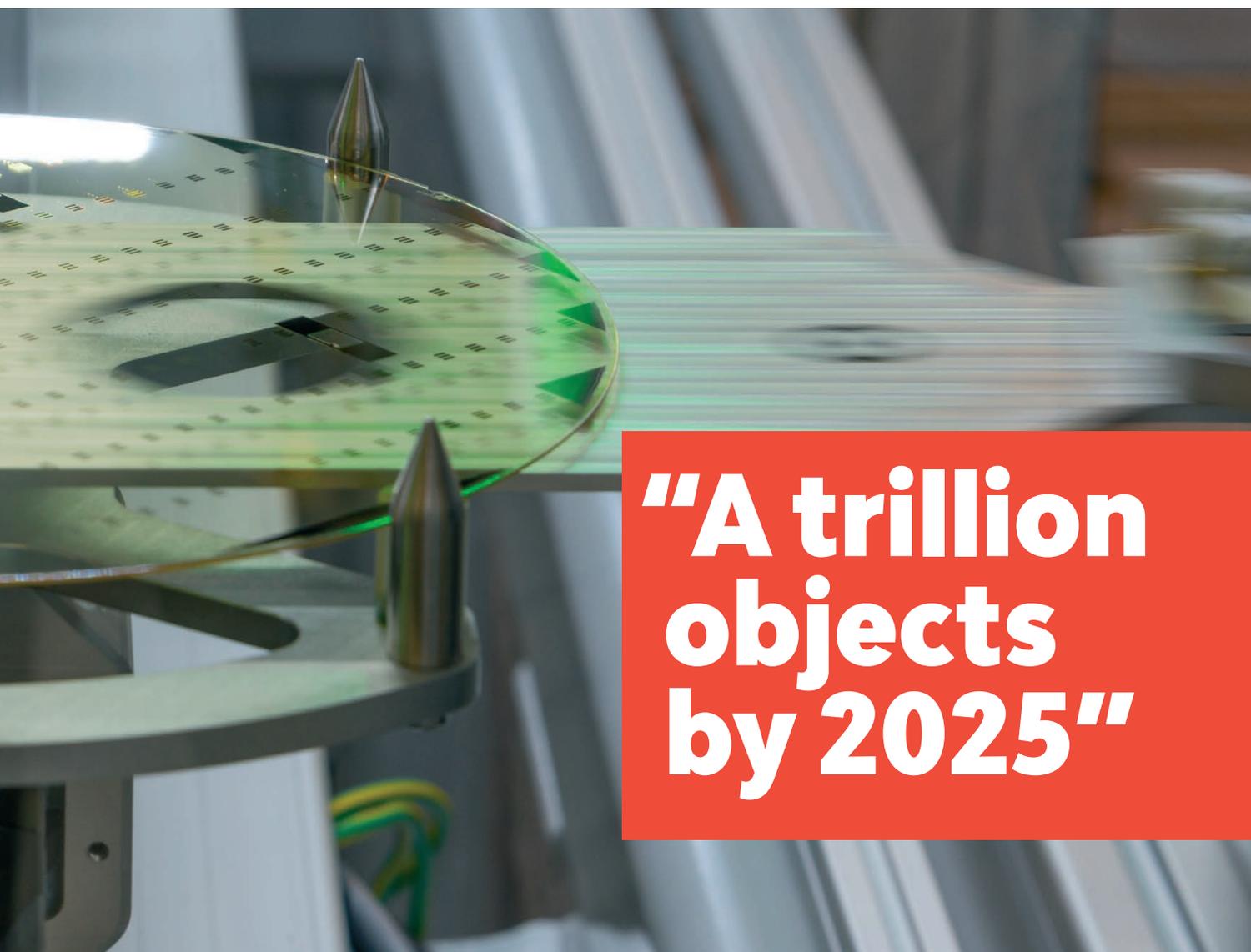
Bringing the technology to market

PragmatIC has developed FlexLogIC™ - its own complete "fab-in-a-box" manufacturing line for its customers to produce FlexICs economically at high volumes. This is a fully automated system which PragmatIC can deliver, install and set up, even at manufacturing locations such as label and packaging facilities with little or no experience in the semiconductor industry. The detailed material recipes, end-to-end process flow, in-line quality monitoring and feedback control loops are implemented within the equipment and software design to ensure reliable production without operator intervention.

All the technologies required, like PVD and lithography are implemented in a self-contained clean environment. Capital investment is 100 to 1000

times less than for a conventional silicon IC fab and set up time is typically 6 months. That compares with a typical silicon IC fab calling for billions of dollars in upfront investment and a 2 year lead time.

The upfront design costs for FlexICs are also considerably lower, so new flexible electronic solutions can be developed, tested and rolled out in weeks rather than months, and the end products brought to market much more quickly. The production cycle is less than a day. This reduction in both cost and time lends itself well to a scalable distributed production model. Compared with silicon ICs, where a few huge foundry companies produce most of the world's supply, the FlexLogIC model can support a large number of global manufacturers, across multiple locations, each one closer to the original product manufacturer.



"A trillion objects by 2025"

From pilot line to mass production

The roadmap is clear. PragmatIC is already demonstrating its capabilities with customer trials through its own FlexLogIC "fab-in-a-box" production line at a state-of-the-art production facility in the UK. Evatec have been a technology partner from the early stages of our thin film process development. The Evatec CLUSTERLINE® with its inbuilt flexibility provides PragmatIC with a tool that not only supports the initial FlexIC products but also enables further evolution of PragmatIC's technology platform.

The production line has capacity for 1 billion ICs per year and future lines will have even higher capacity. Overall PragmatIC expects to see a trillion smart products in the market by 2025.

The future

NFC tags in consumer products are just the start. PragmatIC sees lots of potential in areas such as authentication and even medical sensing. Automotive technology is also a huge area where FlexIC technology could make its mark. RFID technology is already in widespread use, especially where the products have a relatively high value, but the much lower cost of FlexICs opens up many more possibilities for low value high volume products. The idea of trillions of smart objects could really become a reality.

Just watch this space!

About PragmatIC

PragmatIC is headquartered in Cambridge, UK, with a new billion-unit production facility in NETPark, Sedgefield.

For more information visit www.pragmatic.tech